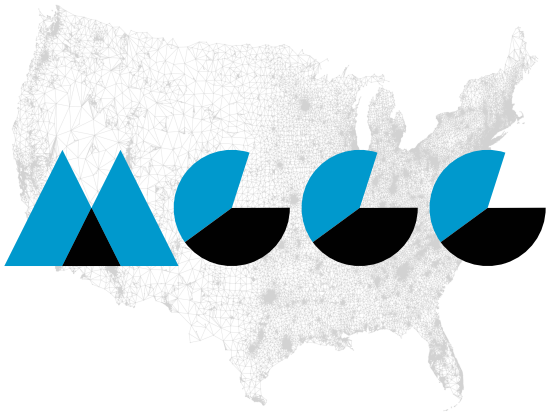
Modeling electoral dynamics for the Portland, Oregon city council



MGGG Redistricting Lab

Contents

Contributors

Christopher Donnay, Moon Duchin, Kathryn Link-Oberstar, Monica Nimmagadda, Madeleine Roberts, and Peter Rock

Version 1.0 | September 18, 2024

1 Executive summary

- Portland is shifting to a system of city council election known as STV, using ranked choice voting in multi-member districts. Modeling can help predict how conditions in the runup to the election will lead to different likely outcomes.
- A surprisingly powerful way to increase the success of candidates preferred by people of color (POC) in Portland's new electoral system is to reduce the number who run.
- If organizers can't control the number of candidates, then restricting endorsements can help boost overall electoral success.
- Zone 1, in particular, presents a major opportunity for POC-preferred and other progressive candidates. Because the field is flooded with moderates, POC-preferred candidates are likely to do very well in an otherwise moderate-to-conservative part of the city.
- To supplement the main analysis, we addressed zone-specific questions by designing custom "toggles" suggested by local organizers.
  - Zone 1 – "racism toggle" – if White voters are less likely to support POC candidates, it boosts White Progressives at the expense of POC, with White Moderate outcomes unchanged.
  - Zone 2 – "Jayapal toggle" – possible entry of Sheshila Jayapal into the race would make her very likely to be elected but would hurt prospects for a second POC-preferred candidate.
  - Zone 3 – "Mapps toggle" – possible entry of Mingus Mapps into the race would depend on whether his main support comes from POC or from White Moderates. The former scenario could substantially hurt POC prospects in Zone 3.
  - Zone 4 – "endorsement toggle" – the impact of having POC groups endorse two versus three candidates is smaller than some of the other scenarios considered, but clearly favors limiting endorsements to two.

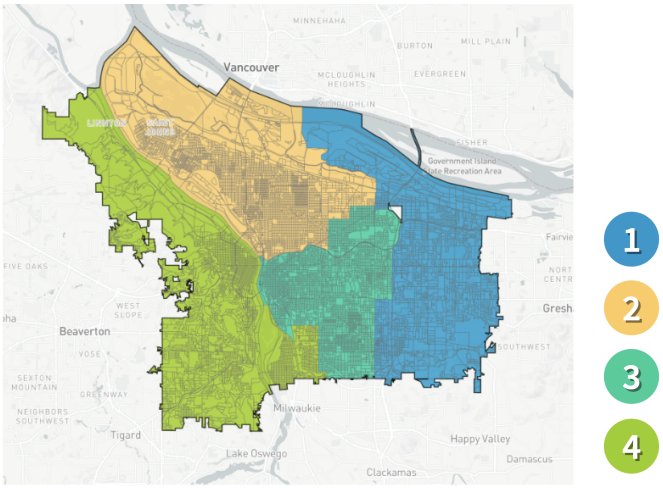


Figure 1. The four zones that will be used in the 2024 election.

2 Introduction and Background

Despite a substantial and growing population of people of color (POC), the Portland City Council has only had four people of color elected since 1971. In November 2022, Portland residents made a significant change to their electoral process by approving a ballot measure that amended the City of Portland's charter to introduce ranked-choice voting [Por22]. Portland has implemented a ranked-choice voting system known as Single Transferable Vote, or STV, which is said to deliver proportional representation without party-based elections. In this system, voters rank candidates according to their preference, rather than selecting just one candidate or approving a group on an equal basis. The first election utilizing this new ranked-choice system is scheduled for November 2024. In this election, voters will have the opportunity to elect 12 city councilors from four districts that elect three members each. We will use the term "zone" for these multi-member districts to emphasize that they are larger than districts would be in a corresponding single-member district system. The zones are shown in Figure 1. This study aims to understand the representational outcomes likely under the new STV system, with particular attention to the potential for electing POC-preferred candidates. We also seeks to give recommendations for political organizers including strategic decisions about how many candidates to run and how best to tailor mobilization efforts to maximize their effectiveness.

We explore the complexities of this new voting system by simulating voter behavior across scenarios that vary the number and type of candidates as well as varying voters' cohesion along ideological and demographic lines. We divide voters either coarsely into two blocs (People of Color (POC) and White (W) voters) or more granularly into three (POC, White Progressives (WP), and White Moderates (WM)). Our models can be adjusted for candidate breakdown, perceived candidate strength, and voter group cohesion, with seven key cohesion scenarios split out to predict electoral outcomes in interpretable terms. Our results suggest that both the number of POC candidates in play and the willingness of WP voters to support candidates primarily identified with communities of color are likely to be the strongest determinants of outcomes in the November election.

All code for replicating the results of our experiments can be found in the associated GitHub repository [MGG24].

3 Study Design

In order to explore the complex interactions of the STV system with the choice of district boundaries, and the population distribution of race and ideology, we construct a variety of model scenarios and study the number of POC-preferred candidates likely to be elected under each. We emphasize that POC-preferred candidates may not themselves be people of color and can come from any race or ethnic group. However, for ease of exposition, we frequently write "POC candidates"; this is simply shorthand for those that are preferred by POC voters. Voting behavior is clearly not simply reducible by racial or ethnic identity and our study tests varied scenarios to address these complexities.

3.1 Model

In past work, MGGG has introduced various generative models for simulating the ranking behavior of voters, such as in [BBD+21, BDDW24]. In this study, we use the Slate Plackett-Luce Model (SPL), which simulates how blocs of voters with varying degrees of cohesion in support of a slate of preferred candidates would fill out their ballots in an election. SPL has been described as modeling "impulsive" voting behavior, where voters choose the candidates they prefer the most. (This is in contrast to other models such as the Slate Bradley-Terry model, which models 'deliberative' voting, in which voters compare each candidate to every other candidate pairwise.) A more detailed explanation of the mechanics of SPL can be found in [BDDW24].

The SPL model has a number of different parameters that can be adjusted to reflect variations in voting behavior: voting blocs, candidate pool, candidate strength, and cohesion. The meanings of these parameters and the choices for this analysis are explained below.

3.2 Parameter Choices

- **Voting Blocs**: Voters are split into groups called "blocs," where each bloc of voters has a preferred slate of candidates. Sometimes voting blocs are aligned with political parties, but in Portland we will divide voters into POC, White Progressive, and White Moderate blocs (or will fuse WP and WM into a White voting bloc in the simplified 2-bloc setup).

  The breakdown of voters into these blocs by zone is seen in Table 1. This breakdown was created using ideology, partisanship, and race data from the both the U.S. Census and Portland's Catalist voter file, as described in Appendix §A.

2-Bloc	POC	White (W)
Zone 1	38%	62%
Zone 2	26%	74%
Zone 3	20%	80%
Zone 4	17%	83%

3-Bloc	POC	White Progressive (WP)	White Moderate (WM)
Zone 1	37.6%	42.8%	19.7%
Zone 2	25.8%	67.6%	6.6%
Zone 3	20.5%	72.1%	7.5%
Zone 4	18.7%	70.7%	10.6%

Table 1. Proportions of blocs of voters under our two different scenarios across four districts.

- **Candidate Pool**: We specify the number of candidates in the election. This also means dividing the candidates up into slates principally supported by each bloc.

  In the two-bloc scenarios, we let the number of (POC, W) candidates be one of $(2, 10)$, $(3, 8)$, $(3, 10)$, $(4, 10)$, $(5, 5)$, and $(6, 8)$.

  In the three-bloc model, we we let the number of (POC, WP, WM) candidates be one of $(2, 5, 5)$, $(2, 8, 2)$, $(3, 4, 4)$, $(3, 5, 5)$, $(3, 7, 1)$, $(4, 5, 5)$, $(5, 3, 2)$, $(5, 4, 1)$, $(6, 4, 4)$, and $(6, 7, 1)$.

- **Candidate Strength**: Candidate strength measures the tendency of the voting blocs to rank the candidates in a consensus order or with more variation. This can help us model the impacts of coordinated campaigns of voter mobilization. Candidate strength can be set in one of three ways; there can be some strong candidates, all candidates can perform about equally, and or an "all bets are off" case, in which candidate strength levels themselves are more random.

  Our primary analysis fixed one strength setting across all scenarios, the "all bets are off" setting.[1]

- **Cohesion**: For each bloc of voters, cohesion parameters measure how likely a voter is to rank a candidate from their own slate in each position of the ballot. If the cohesion is 1 (or 100%), all voters rank their own candidates above the other slates (although the ordering of the candidates within their slate may vary depending on candidate strength). If cohesion is 1/2, they flip a fair coin at each position to determine if it should be filled by their own slate or an opposing slate. For simplicity, we give these as percentages between 0 and 100.

  We use seven different scenarios based on varying levels of cohesion across race, and ideology, and with varying degrees of crossover, to realistically represent Portland voting behavior. These scenarios were modeled for both the two-bloc and three-bloc scenarios.

  A) Race Predominates. Both POC and W voters prefer candidates of the same race as their own.

  B) Race & Ideology. POC and W voters take both race and ideology into consideration, but still prefer candidates of the same race as their own.

  C) Low Polarization. POC and W voters are more indifferent to candidates of the same race.

  D) Ideology predominates (three-bloc scenario only).

  E) WP prefer POC. WP voters slightly prefer POC than W candidates.

  F) Race and ideology with strong POC lean. W voters strongly prefer POC candidates over W candidates.

  G) POC crossover, WP major crossover. POC voters slightly prefer POC candidates and WP voters strongly prefer POC candidates.

  The numerical levels of cohesion are given in Table 2.

[1] As a sensitivity test, we examined Scenarios F and G with varying candidate strength levels. The findings remained consistent.

Scenario	Description	2 Blocs (POC-W)	3 Blocs (POC-WP-WM)
A	Race predominates	$\begin{pmatrix} 80 & 20 \\ 10 & 90 \end{pmatrix}$	$\begin{pmatrix} 80 & 10 & 10 \\ 10 & 45 & 45 \\ 10 & 45 & 45 \end{pmatrix}$
B	Race + Ideology	$\begin{pmatrix} 60 & 40 \\ 25 & 75 \end{pmatrix}$	$\begin{pmatrix} 60 & 30 & 10 \\ 30 & 60 & 10 \\ 10 & 10 & 80 \end{pmatrix}$
C	Low polarization	$\begin{pmatrix} 60 & 40 \\ 40 & 60 \end{pmatrix}$	$\begin{pmatrix} 40 & 30 & 30 \\ 30 & 40 & 30 \\ 30 & 30 & 40 \end{pmatrix}$
D	Ideology predominates	N/A	$\begin{pmatrix} 45 & 45 & 10 \\ 45 & 45 & 10 \\ 10 & 10 & 80 \end{pmatrix}$
E	WP prefer POC	$\begin{pmatrix} 80 & 20 \\ 40 & 60 \end{pmatrix}$	$\begin{pmatrix} 80 & 10 & 10 \\ 80 & 10 & 10 \\ 10 & 10 & 80 \end{pmatrix}$
F	Race + Ideology, strong POC cohesion	$\begin{pmatrix} 80 & 20 \\ 30 & 70 \end{pmatrix}$	$\begin{pmatrix} 80 & 10 & 10 \\ 30 & 60 & 10 \\ 10 & 5 & 85 \end{pmatrix}$
G	POC crossover, WP major crossover	$\begin{pmatrix} 60 & 40 \\ 30 & 70 \end{pmatrix}$	$\begin{pmatrix} 60 & 30 & 10 \\ 45 & 45 & 10 \\ 10 & 5 & 85 \end{pmatrix}$

Table 2. Cohesion settings for our seven scenarios. Each cohesion setting is either a 2×2 or 3×3 matrix. For example, in scenario A, the first row of the matrix tells you that POC voters are 80% likely to support POC-identified candidates, 10% likely to choose candidates aligned with White Progressives, and 10% likely to support White Moderates.

4 Main Results

In each two-bloc scenario that we analyzed, a reduction in the number of candidates from the POC-preferred slate resulted in a higher number of POC-preferred candidates elected overall. This can be seen in Figure 2. Scenario A, where race dominates in voter behavior, was the least conducive to

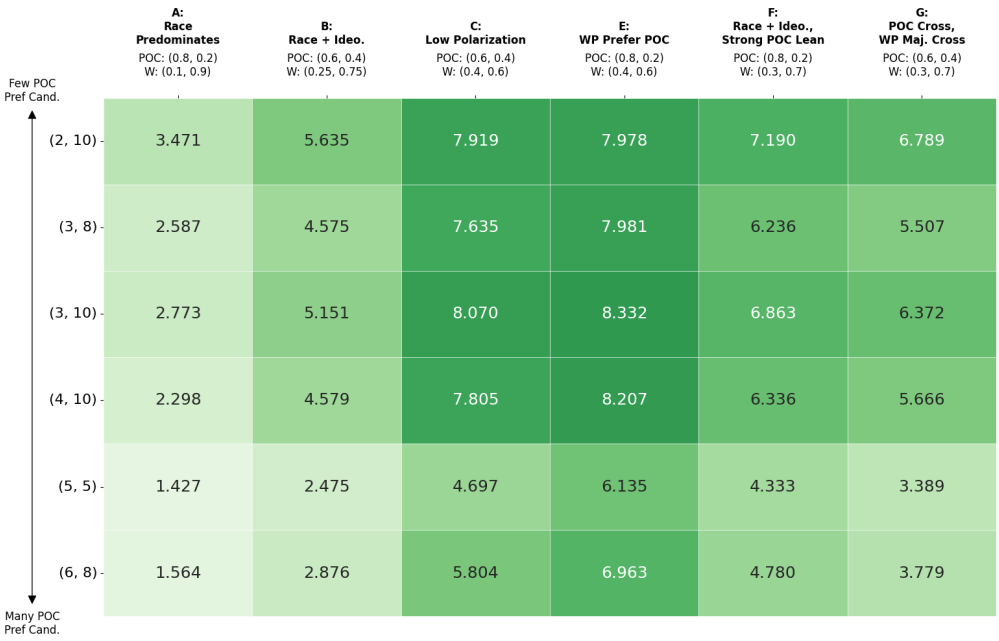


Figure 2. The average number of POC candidates elected over 1000 trials; each row is a fixed number of candidates (POC-W) and each column is a different cohesion scenario.

electing POC-preferred candidates among all scenarios, underscoring the influence of high levels of voter cohesion within the W bloc. Furthermore, the impact of voter cohesion is also evident in Scenarios C and E, where the low polarization (C) and a slight preference for POC candidates (E) within the White bloc resulted in the greater number of POC-preferred candidates elected.

Similar patterns persist across the three-bloc election scenarios. In all four zones, Scenario E consistently yielded the highest number of POC-preferred candidates elected, indicating a significant influence wielded by the WP bloc in candidate elections—which is reasonable, since this is the numerically dominant group in Portland. Furthermore, despite the conservative nature of Zone 1, POC-preferred candidates tended to perform strongly, presenting a notable opportunity for POC progressives to gain traction in what is typically a moderate-to-conservative area of the city. This can be seen in Figure 3 and Figure 14.

The analysis also suggests that limiting the candidate pool can enhance POC representation. Running fewer POC-preferred candidates improved the number of POC elected candidates across various combinations of WP and WM slates, as well as different levels of cohesion and crossover. However, it's important to note that this trend may not hold in instances where White progressive voters show a strong tendency to support POC candidates. Overall, limiting the candidate slate appears to be a good strategy for strong POC representation on Portland's city council.

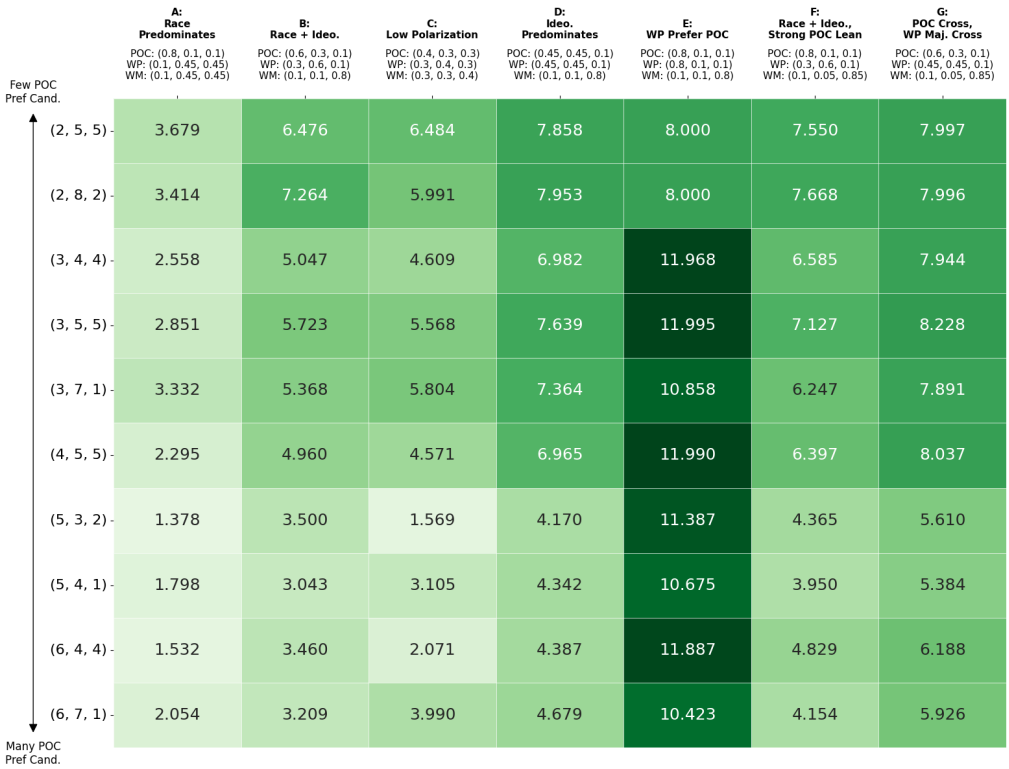


Figure 3. The average number of POC candidates elected over 1000 trials; each row is a fixed number of candidates (POC-WP-WM) and each column is a different cohesion scenario. Note that columns A and E—WP choosing conservative candidates at rates identical to WM voters or choosing POC-preferred candidates at rates identical to POC voters—are highly unrealistic, but are included for illustrative purposes.

5 "Toggles" by Zone

In addition to the scenarios discussed above, we also ran a separate analysis specific to the unique electoral landscape of each zone. Using information provided by local organizers, we determined a possible election scenario for each zone, and toggled this scenario occurring in order to understand its impact on POC-preferred candidates.

Zone 1: What happens if POC candidates get less support from WP and WM? This is modeled by increasing the cohesion of the WP and WM blocs. This toggle reduces the number of POC candidates elected from consistently 1 to a split between 0 and 1. There is a corresponding rise in the number of WP candidates elected, from consistently 1 to a split between 1 and 2. There is no significant change in WM candidates. See Figure 4.

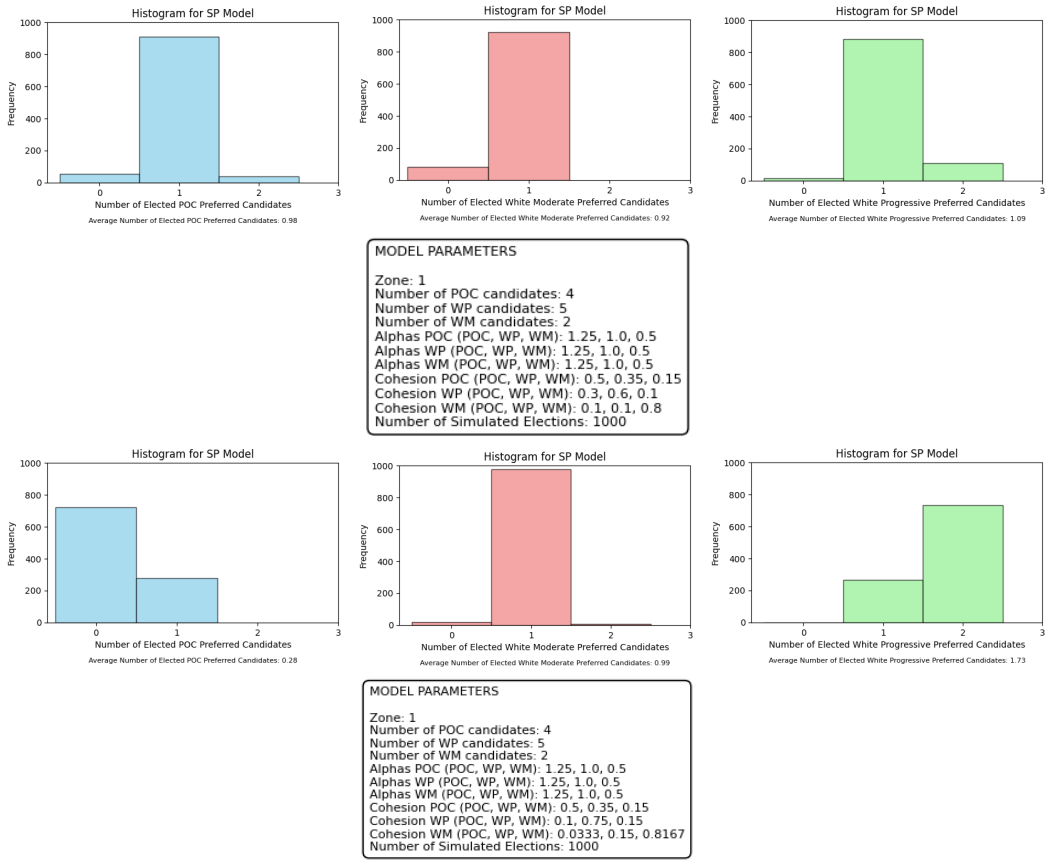


Figure 4. What happens if POC candidates get less support from WP and WM? The first row shows the baseline behavior in Zone 1, while the second shows an increased cohesion of the WP and WM blocs.

Zone 2: What happens if Sheshila Jayapal (a potential progressive POC candidate) joins the race? This is modeled by adding a POC candidate with strong within-bloc support. This toggle reduces the number of POC candidates elected from a split between 1 and 2 to consistently 1. There is a corresponding rise in the number of WP candidates elected, from a split between 1 and 2 to consistently 2. There is no change in WM candidates. See Figure 5.

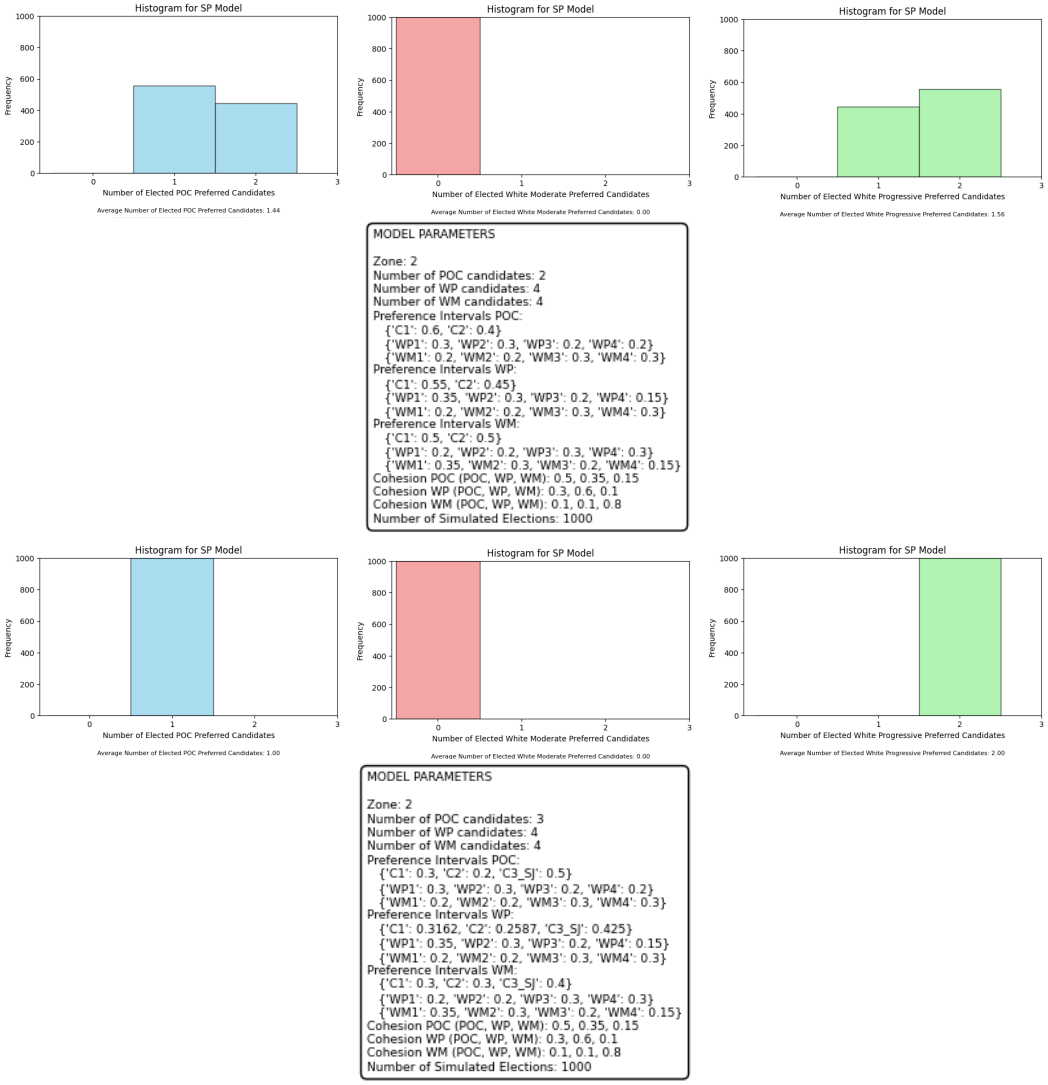


Figure 5. What happens if Sheshila Jayapal (a potential progressive POC candidate) joins the race? The first row shows the baseline behavior in Zone 2, while the second shows the effect of a POC candidate with strong candidate support.

Zone 3: What happens if Mingus Mapps joins the race? This is modeled by adding a candidate with strong support; we try adding Mapps as as POC and as a WM candidate. If Mapps is added as a POC candidate, he pulls the average number of POC elected candidates down by introducing scenarios in which 0 POC candidates are elected. There is a corresponding rise in the number of WP candidates elected, from consistently 2 to a split between 2 and 3. If Mapps is added as a WM candidate, he has no significant impact on the race. See Figure 6.

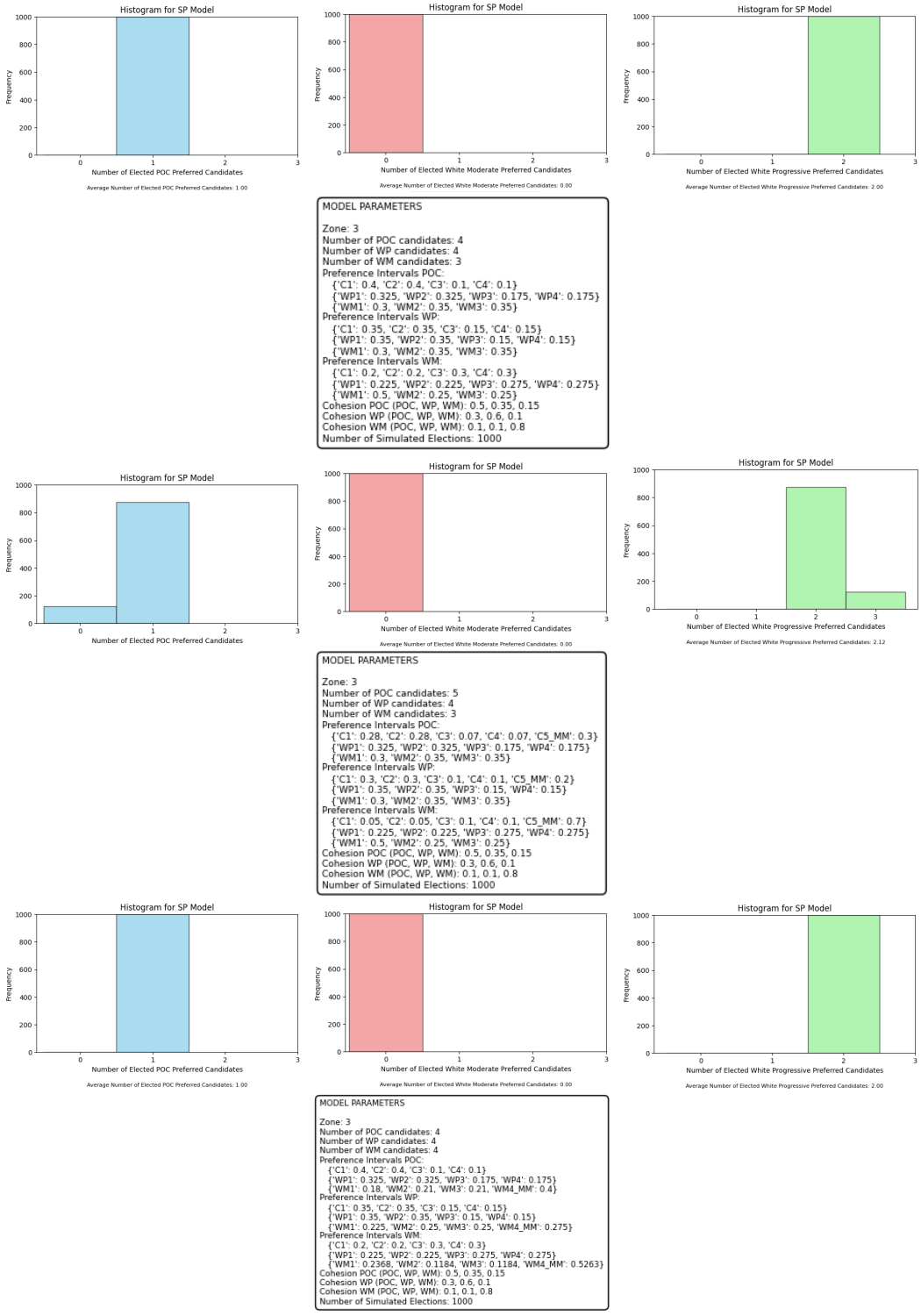


Figure 6. What happens if Mingus Mapps joins the race? The first row shows the baseline behavior in Zone 3, while the second shows the effect of adding Mapps as a POC candidate with strong candidate support, and the third shows the effect of adding Mapps as a MW candidate with strong candidate support.

Zone 4: What happens if more or fewer POC candidates receive an endorsement? This is modeled by toggling between 2 and 3 POC candidates having strong candidate support. As seen before, increasing the number of strong POC candidates actually reduces the number of POC candidates elected and helps WP candidates. See Figure 7.

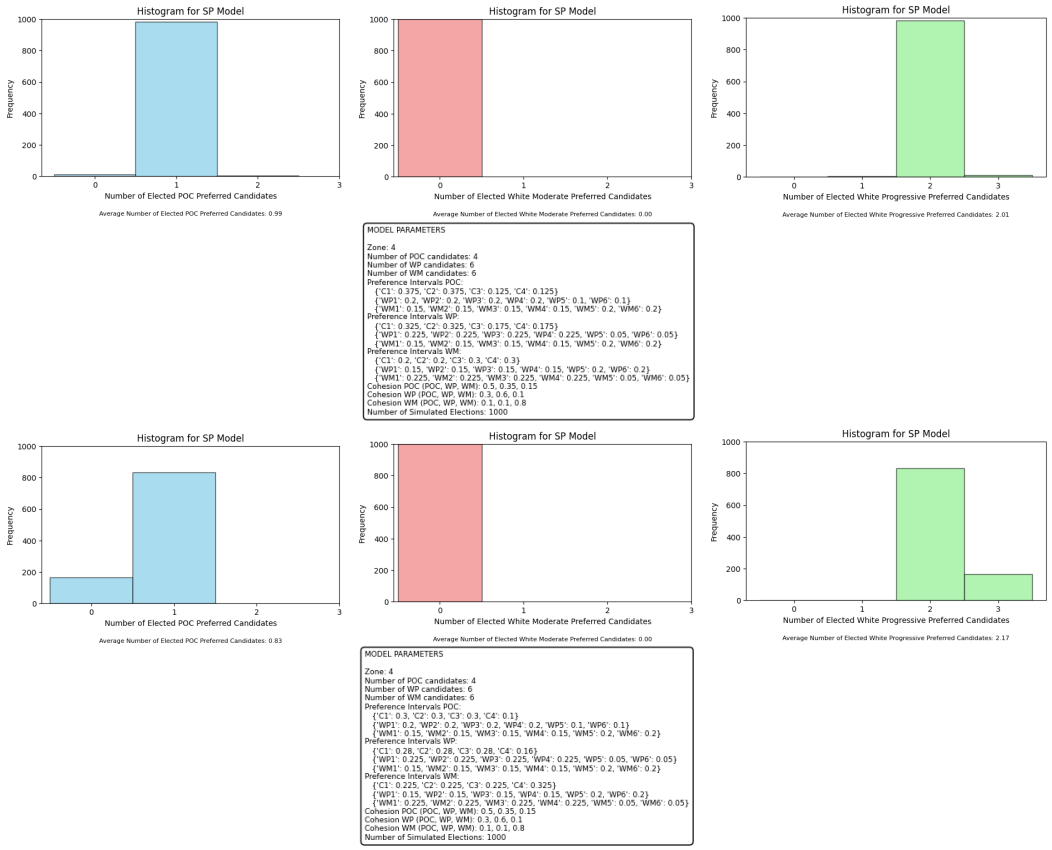


Figure 7. What happens if more POC candidates receive an endorsement? This is modeled by toggling between 2 and 3 POC candidates having strong candidate support. The first row shows the baseline behavior in Zone 4 of endorsing 2 POC candidates, while the second shows the effect of adding a third endorsement of a POC candidate.

6 Conclusion

As Portland navigates the complexities of introducing proportional ranked-choice voting in their upcoming November 2024 city council election, this study offers insight into variables of voter behavior, candidate entry, and organizing strategy. Both the nature and magnitude of possible impacts are visible in the results. At the highest level of generality, organizers should consider working to limit the number of POC-identified candidates in the field or to limit endorsements. Even though transferable vote mechanisms reduce the negative impacts of vote-splitting, this study shows that they are not eliminated completely.

References

[BBD+21] Gerdus Benadè, Ruth Buck, Moon Duchin, Dara Gold, and Thomas Weighill. Ranked choice voting and proportional representation, February 2021. Available at SSRN: https://ssrn.com/abstract=3778021 or http://dx.doi.org/10.2139/ssrn.3778021.

[BDDW24] Gerdus Benadè, Christopher Donnay, Moon Duchin, and Thomas Weighill. Proportionality for ranked voting, in theory and practice. https://mggg.org/PRVTP, 2024.

[MGG24] MGGG. Portland replication repo, 2024. GitHub replication repository, https://github.com/mggg/Portland-Replication-Repo.

[Por22] Portland.gov. Portland voters approve charter reform, city launches transition. November 2022. https://www.portland.gov/transition/news/2022/11/9/portland-voters-approve-charter-reform-city-launches-transition.

A Using the Voter File to Design Bloc Structure

The proportion of White voters identified as progressive and moderate was computed using Portland's Catalist voter file. We summarized these in Table 1. The voter file featured two scores that we decided to use to predict ideology: Ideology (Ideo22) and Vote Choice Index (VCI22).

Scores on the Ideology model range from 0 to 100, where a score of 0 is given to people who tend to endorse overall conservative views and a score of 100 is applied to people who tend to endorse an overall progressive platform. People with scores of 50 or close to this number are not likely to be strongly committed to either a progressive or a conservative platform in a way that is identifiable by variables on the voter file.

Scores on the Vote Choice model indicate the probability that an individual will support the Democratic candidate in a typical competitive election against a Republican candidate. The scores range from 0 to 100, with higher scores indicating a higher likelihood to vote for Democrats.

We set a threshold of (Ideo22, VCI22)$\geq (30, 50)$ to be labeled as progressive. A plot of (Ideo22, VCI22) is provided in Figure 8. How this breaks down by POC, WP, and WM voters is provided in Figure 9.

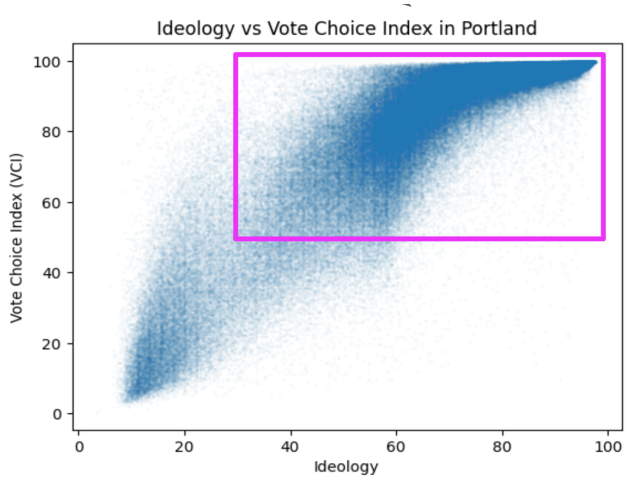


Figure 8. A plot of Ideo22 vs. VCI22. The highlighted region is our chosen definition of progressive.

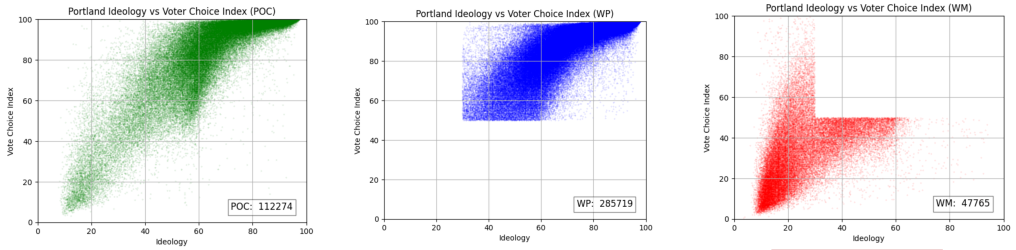
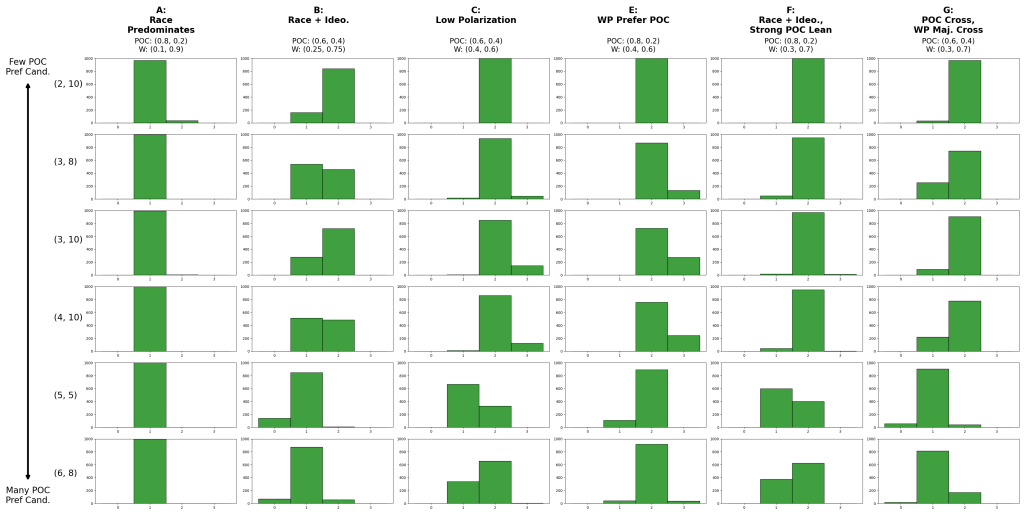


Figure 9. A plot of Ideo22 vs. VCI22 for POC, WP, and WM voters.

B Full Results By Zone

For completeness, we include all results by zone as tables of averages and as histograms.



Few POC Pref Cand.	A: Race Predominates POC: (0.8, 0.2) W: (0.1, 0.9)	B: Race + Ideo. POC: (0.6, 0.4) W: (0.25, 0.75)	C: Low Polarization POC: (0.6, 0.4) W: (0.4, 0.6)	E: WP Prefer POC POC: (0.8, 0.2) W: (0.4, 0.6)	F: Race + Ideo., Strong POC Lean POC: (0.8, 0.2) W: (0.3, 0.7)	G: POC Cross, WP Maj. Cross POC: (0.6, 0.4) W: (0.3, 0.7)
(2, 10)	1.034	1.840	2.000	2.000	2.000	1.967
(3, 8)	1.001	1.459	2.029	2.131	1.951	1.745
(3, 10)	1.005	1.720	2.142	2.276	1.996	1.912
(4, 10)	1.000	1.486	2.111	2.243	1.963	1.782
(5, 5)	1.000	0.864	1.329	1.893	1.402	0.984
(6, 8)	1.000	0.989	1.663	1.996	1.623	1.153

Many POC Pref Cand.

Figure 10. Histograms and average values for number of POC candidates elected in Zone 1 in the 2-bloc setting. Each row is a fixed number of candidates (POC-W) and each column is a different cohesion scenario.

Few POC Pref Cand.	A: Race Predominates POC: (0.8, 0.2) W: (0.1, 0.9)	B: Race + Ideo. POC: (0.6, 0.4) W: (0.25, 0.75)	C: Low Polarization POC: (0.6, 0.4) W: (0.4, 0.6)	E: WP Prefer POC POC: (0.8, 0.2) W: (0.4, 0.6)	F: Race + Ideo., Strong POC Lean POC: (0.8, 0.2) W: (0.3, 0.7)	G: POC Cross, WP Maj. Cross POC: (0.6, 0.4) W: (0.3, 0.7)
(2, 10)	0.996	1.433	1.994	2.000	1.901	1.789
(3, 8)	0.896	1.108	1.934	2.008	1.661	1.403
(3, 10)	0.935	1.266	2.023	2.057	1.831	1.651
(4, 10)	0.847	1.112	1.965	2.032	1.683	1.431
(5, 5)	0.390	0.624	1.179	1.580	1.046	0.840
(6, 8)	0.503	0.732	1.465	1.788	1.147	0.940

Many POC Pref Cand.

Figure 11. Histograms and average values for number of POC candidates elected in Zone 2 in the 2-bloc setting. Each row is a fixed number of candidates (POC-W) and each column is a different cohesion scenario.

Few POC Pref Cand.	A: Race Predominates POC: (0.8, 0.2) W: (0.1, 0.9)	B: Race + Ideo. POC: (0.6, 0.4) W: (0.25, 0.75)	C: Low Polarization POC: (0.6, 0.4) W: (0.4, 0.6)	E: WP Prefer POC POC: (0.8, 0.2) W: (0.4, 0.6)	F: Race + Ideo., Strong POC Lean POC: (0.8, 0.2) W: (0.3, 0.7)	G: POC Cross, WP Maj. Cross POC: (0.6, 0.4) W: (0.3, 0.7)
(2, 10)	0.809	1.218	1.970	1.988	1.702	1.560
(3, 8)	0.449	1.013	1.846	1.940	1.365	1.211
(3, 10)	0.523	1.113	1.969	2.008	1.596	1.445
(4, 10)	0.311	1.005	1.882	1.981	1.401	1.284
(5, 5)	0.031	0.554	1.092	1.380	0.956	0.789
(6, 8)	0.052	0.620	1.360	1.643	1.021	0.863

Many POC Pref Cand.

Figure 12. Histograms and average values for number of POC candidates elected in Zone 3 in the 2-bloc setting. Each row is a fixed number of candidates (POC-W) and each column is a different cohesion scenario.

	A: Race Predominates POC: (0.8, 0.2) W: (0.1, 0.9)	B: Race + Ideo. POC: (0.6, 0.4) W: (0.25, 0.75)	C: Low Polarization POC: (0.6, 0.4) W: (0.4, 0.6)	E: WP Prefer POC POC: (0.8, 0.2) W: (0.4, 0.6)	F: Race + Ideo., Strong POC Lean POC: (0.8, 0.2) W: (0.3, 0.7)	G: POC Cross, WP Maj. Cross POC: (0.6, 0.4) W: (0.3, 0.7)
(2, 10)	0.632	1.144	1.955	1.990	1.587	1.473
(3, 8)	0.241	0.995	1.826	1.902	1.259	1.148
(3, 10)	0.310	1.052	1.936	1.991	1.440	1.364
(4, 10)	0.140	0.976	1.847	1.951	1.289	1.169
(5, 5)	0.006	0.433	1.097	1.282	0.929	0.776
(6, 8)	0.009	0.535	1.316	1.536	0.989	0.823

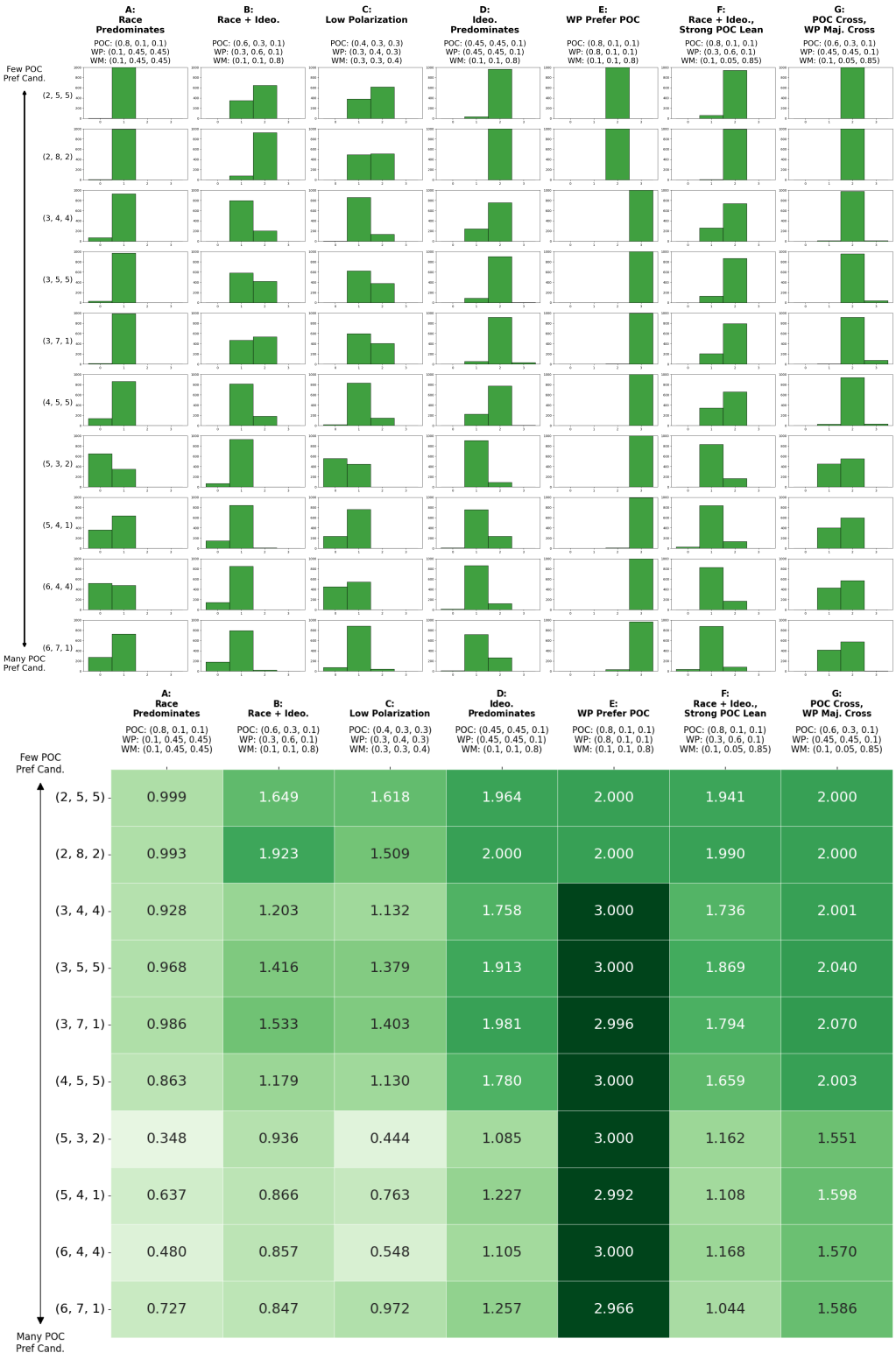
Few POC Pref Cand.

Many POC Pref Cand.

Figure 13. Histograms and average values for number of POC candidates elected in Zone 4 in the 2-bloc setting. Each row is a fixed number of candidates (POC-W) and each column is a different cohesion scenario.

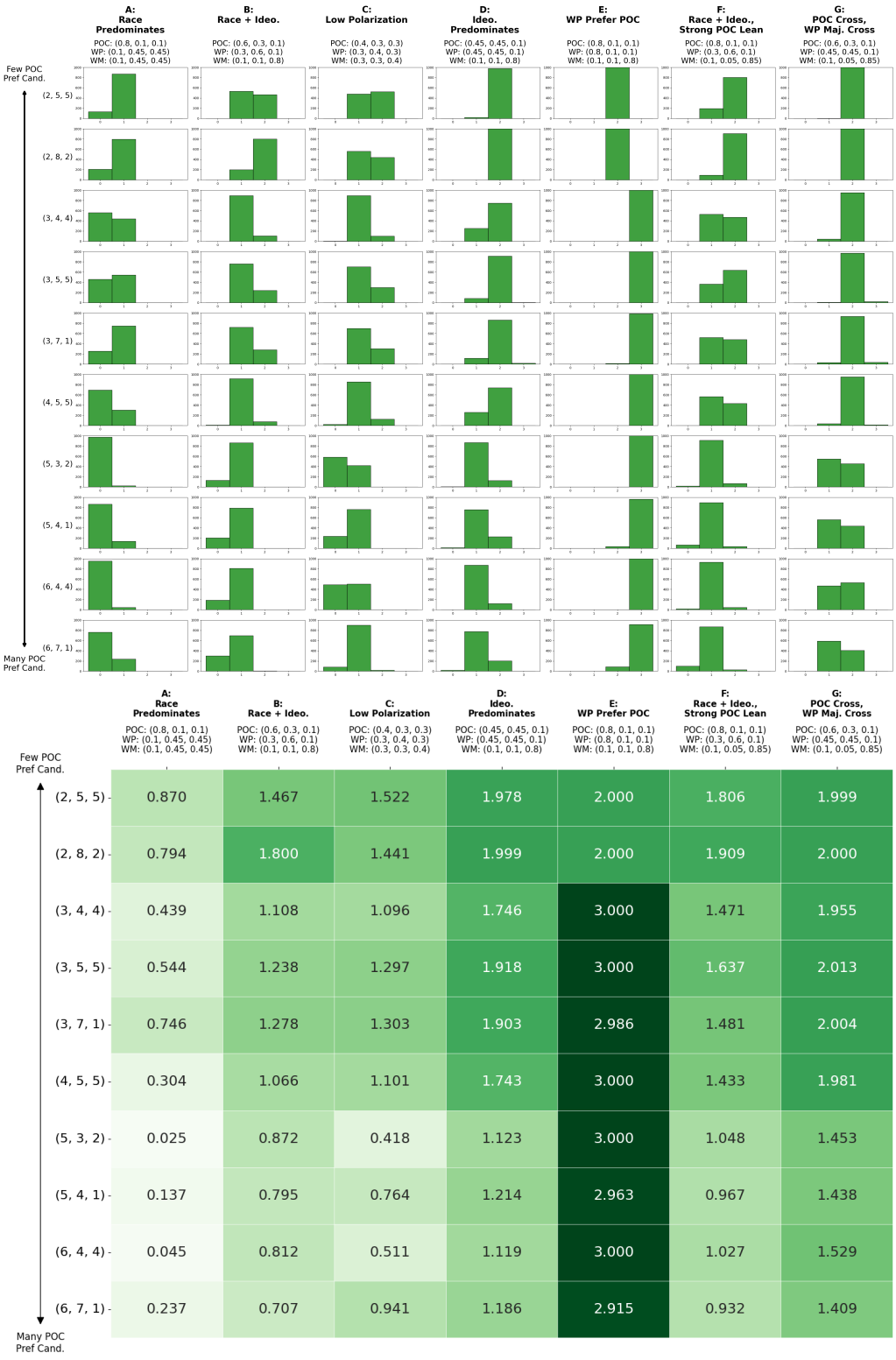
	A: Race Predominates (POC: (0.8, 0.1, 0.1) WP: (0.1, 0.45, 0.45) WM: (0.1, 0.45, 0.45))	B: Race + Ideo. (POC: (0.6, 0.3, 0.1) WP: (0.3, 0.6, 0.1) WM: (0.1, 0.1, 0.8))	C: Low Polarization (POC: (0.4, 0.3, 0.3) WP: (0.3, 0.4, 0.3) WM: (0.3, 0.3, 0.4))	D: Ideo. Predominates (POC: (0.45, 0.45, 0.1) WP: (0.45, 0.45, 0.1) WM: (0.1, 0.1, 0.8))	E: WP Prefer POC (POC: (0.8, 0.1, 0.1) WP: (0.8, 0.1, 0.1) WM: (0.1, 0.1, 0.8))	F: Race + Ideo., Strong POC Lean (POC: (0.8, 0.1, 0.1) WP: (0.3, 0.6, 0.1) WM: (0.1, 0.05, 0.85))	G: POC Cross, WP Maj. Cross (POC: (0.6, 0.3, 0.1) WP: (0.45, 0.45, 0.1) WM: (0.1, 0.05, 0.85))
Few POC Pref Cand.							
(2, 5, 5)	1.115	1.926	1.856	1.950	2.000	1.999	2.000
(2, 8, 2)	1.022	1.870	1.612	1.961	2.000	1.979	1.998
(3, 4, 4)	1.001	1.647	1.286	1.701	2.968	1.957	2.029
(3, 5, 5)	1.018	1.856	1.606	1.894	2.995	2.018	2.173
(3, 7, 1)	1.023	1.487	1.807	1.758	2.004	1.819	1.959
(4, 5, 5)	1.003	1.639	1.276	1.703	2.990	1.951	2.072
(5, 3, 2)	1.000	0.827	0.320	0.811	2.399	1.177	1.171
(5, 4, 1)	1.000	0.885	0.839	0.865	2.000	1.086	1.199
(6, 4, 4)	1.000	1.044	0.544	1.035	2.887	1.617	1.572
(6, 7, 1)	1.000	1.020	1.127	1.140	2.000	1.327	1.667
Many POC Pref Cand.							

Figure 14. Histograms and average values for number of POC candidates elected in Zone 1 in the 3-bloc setting. Each row is a fixed number of candidates (POC-WP-WM) and each column is a different cohesion scenario. Note that columns A and E—WP choosing conservative candidates at rates identical to WM voters or choosing POC-preferred candidates at rates identical to POC voters—are highly unrealistic, but are included for illustrative purposes.



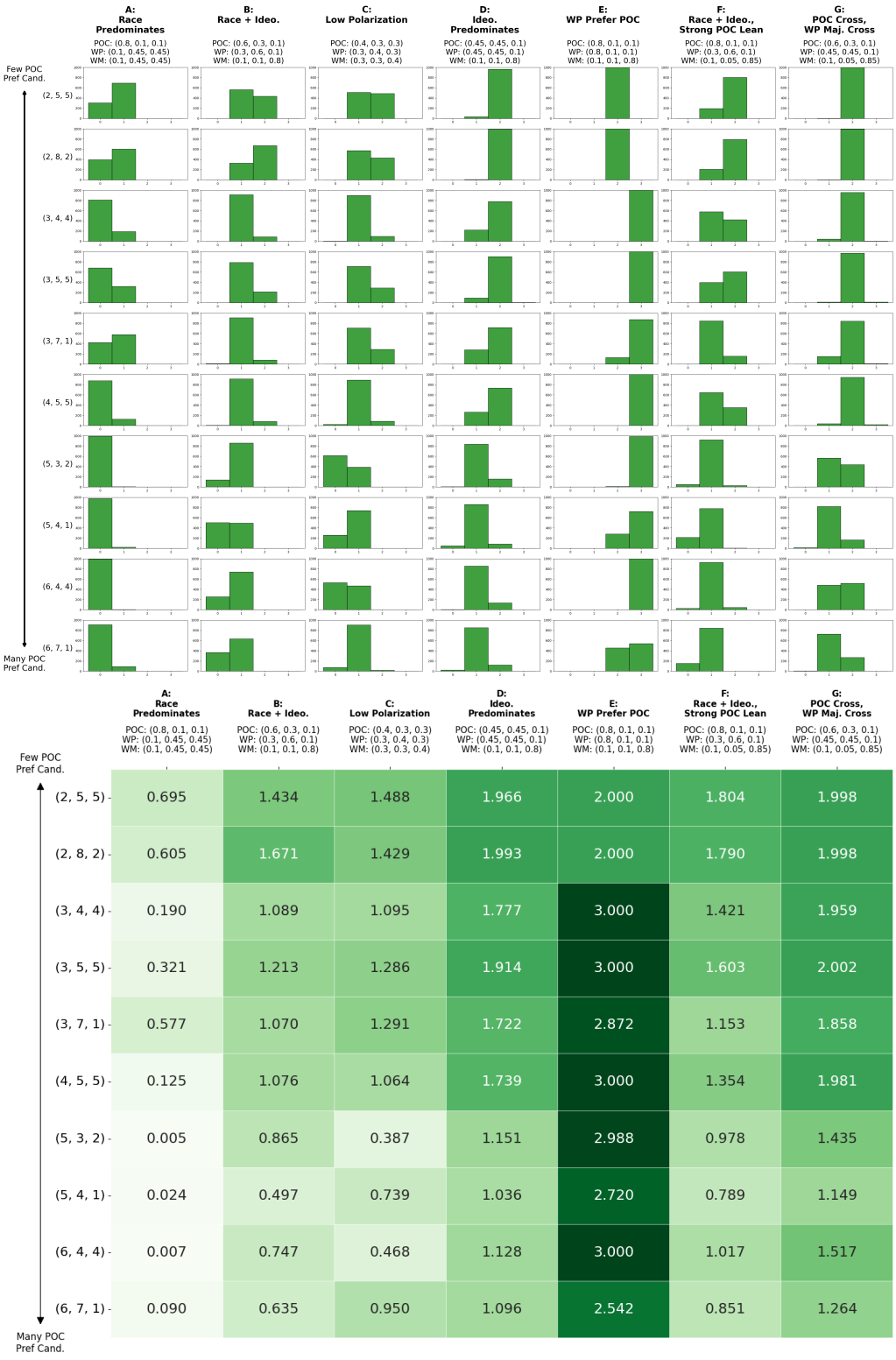
	A: Race Predominates (POC: (0.8, 0.1, 0.1) WP: (0.1, 0.45, 0.45) WM: (0.1, 0.45, 0.45))	B: Race + Ideo. (POC: (0.6, 0.3, 0.1) WP: (0.3, 0.6, 0.1) WM: (0.1, 0.1, 0.8))	C: Low Polarization (POC: (0.4, 0.3, 0.3) WP: (0.3, 0.4, 0.3) WM: (0.3, 0.3, 0.4))	D: Ideo. Predominates (POC: (0.45, 0.45, 0.1) WP: (0.45, 0.45, 0.1) WM: (0.1, 0.1, 0.8))	E: WP Prefer POC (POC: (0.8, 0.1, 0.1) WP: (0.8, 0.1, 0.1) WM: (0.1, 0.1, 0.8))	F: Race + Ideo., Strong POC Lean (POC: (0.8, 0.1, 0.1) WP: (0.3, 0.6, 0.1) WM: (0.1, 0.05, 0.85))	G: POC Cross, WP Maj. Cross (POC: (0.6, 0.3, 0.1) WP: (0.45, 0.45, 0.1) WM: (0.1, 0.05, 0.85))
Few POC Pref Cand.							
(2, 5, 5)	0.999	1.649	1.618	1.964	2.000	1.941	2.000
(2, 8, 2)	0.993	1.923	1.509	2.000	2.000	1.990	2.000
(3, 4, 4)	0.928	1.203	1.132	1.758	3.000	1.736	2.001
(3, 5, 5)	0.968	1.416	1.379	1.913	3.000	1.869	2.040
(3, 7, 1)	0.986	1.533	1.403	1.981	2.996	1.794	2.070
(4, 5, 5)	0.863	1.179	1.130	1.780	3.000	1.659	2.003
(5, 3, 2)	0.348	0.936	0.444	1.085	3.000	1.162	1.551
(5, 4, 1)	0.637	0.866	0.763	1.227	2.992	1.108	1.598
(6, 4, 4)	0.480	0.857	0.548	1.105	3.000	1.168	1.570
(6, 7, 1)	0.727	0.847	0.972	1.257	2.966	1.044	1.586
Many POC Pref Cand.							

Figure 15. Histograms and average values for number of POC candidates elected in Zone 2 in the 3-bloc setting. Each row is a fixed number of candidates (POC-WP-WM) and each column is a different cohesion scenario. Note that columns A and E—WP choosing conservative candidates at rates identical to WM voters or choosing POC-preferred candidates at rates identical to POC voters—are highly unrealistic, but are included for illustrative purposes.



	A: Race Predominates (POC: (0.8, 0.1, 0.1) WP: (0.1, 0.45, 0.45) WM: (0.1, 0.45, 0.45))	B: Race + Ideo. (POC: (0.6, 0.3, 0.1) WP: (0.3, 0.6, 0.1) WM: (0.1, 0.1, 0.8))	C: Low Polarization (POC: (0.4, 0.3, 0.3) WP: (0.3, 0.4, 0.3) WM: (0.3, 0.3, 0.4))	D: Ideo. Predominates (POC: (0.45, 0.45, 0.1) WP: (0.45, 0.45, 0.1) WM: (0.1, 0.1, 0.8))	E: WP Prefer POC (POC: (0.8, 0.1, 0.1) WP: (0.8, 0.1, 0.1) WM: (0.1, 0.1, 0.8))	F: Race + Ideo., Strong POC Lean (POC: (0.8, 0.1, 0.1) WP: (0.3, 0.6, 0.1) WM: (0.1, 0.05, 0.85))	G: POC Cross, WP Maj. Cross (POC: (0.6, 0.3, 0.1) WP: (0.45, 0.45, 0.1) WM: (0.1, 0.05, 0.85))
Few POC Pref Cand.							
(2, 5, 5)	0.870	1.467	1.522	1.978	2.000	1.806	1.999
(2, 8, 2)	0.794	1.800	1.441	1.999	2.000	1.909	2.000
(3, 4, 4)	0.439	1.108	1.096	1.746	3.000	1.471	1.955
(3, 5, 5)	0.544	1.238	1.297	1.918	3.000	1.637	2.013
(3, 7, 1)	0.746	1.278	1.303	1.903	2.986	1.481	2.004
(4, 5, 5)	0.304	1.066	1.101	1.743	3.000	1.433	1.981
(5, 3, 2)	0.025	0.872	0.418	1.123	3.000	1.048	1.453
(5, 4, 1)	0.137	0.795	0.764	1.214	2.963	0.967	1.438
(6, 4, 4)	0.045	0.812	0.511	1.119	3.000	1.027	1.529
(6, 7, 1)	0.237	0.707	0.941	1.186	2.915	0.932	1.409
Many POC Pref Cand.							

Figure 16. Histograms and average values for number of POC candidates elected in Zone 3 in the 3-bloc setting. Each row is a fixed number of candidates (POC-WP-WM) and each column is a different cohesion scenario. Note that columns A and E—WP choosing conservative candidates at rates identical to WM voters or choosing POC-preferred candidates at rates identical to POC voters—are highly unrealistic, but are included for illustrative purposes.



	A: Race Predominates (POC: (0.8, 0.1, 0.1) WP: (0.1, 0.45, 0.45) WM: (0.1, 0.45, 0.45))	B: Race + Ideo. (POC: (0.6, 0.3, 0.1) WP: (0.3, 0.6, 0.1) WM: (0.1, 0.1, 0.8))	C: Low Polarization (POC: (0.4, 0.3, 0.3) WP: (0.3, 0.4, 0.3) WM: (0.3, 0.3, 0.4))	D: Ideo. Predominates (POC: (0.45, 0.45, 0.1) WP: (0.45, 0.45, 0.1) WM: (0.1, 0.1, 0.8))	E: WP Prefer POC (POC: (0.8, 0.1, 0.1) WP: (0.8, 0.1, 0.1) WM: (0.1, 0.1, 0.8))	F: Race + Ideo., Strong POC Lean (POC: (0.8, 0.1, 0.1) WP: (0.3, 0.6, 0.1) WM: (0.1, 0.05, 0.85))	G: POC Cross, WP Maj. Cross (POC: (0.6, 0.3, 0.1) WP: (0.45, 0.45, 0.1) WM: (0.1, 0.05, 0.85))
Few POC Pref Cand.							
(2, 5, 5)	0.695	1.434	1.488	1.966	2.000	1.804	1.998
(2, 8, 2)	0.605	1.671	1.429	1.993	2.000	1.790	1.998
(3, 4, 4)	0.190	1.089	1.095	1.777	3.000	1.421	1.959
(3, 5, 5)	0.321	1.213	1.286	1.914	3.000	1.603	2.002
(3, 7, 1)	0.577	1.070	1.291	1.722	2.872	1.153	1.858
(4, 5, 5)	0.125	1.076	1.064	1.739	3.000	1.354	1.981
(5, 3, 2)	0.005	0.865	0.387	1.151	2.988	0.978	1.435
(5, 4, 1)	0.024	0.497	0.739	1.036	2.720	0.789	1.149
(6, 4, 4)	0.007	0.747	0.468	1.128	3.000	1.017	1.517
(6, 7, 1)	0.090	0.635	0.950	1.096	2.542	0.851	1.264
Many POC Pref Cand.							

Figure 17. Histograms and average values for number of POC candidates elected in Zone 4 in the 3-bloc setting. Each row is a fixed number of candidates (POC-WP-WM) and each column is a different cohesion scenario. Note that columns A and E—WP choosing conservative candidates at rates identical to WM voters or choosing POC-preferred candidates at rates identical to POC voters—are highly unrealistic, but are included for illustrative purposes.